Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-23 (Canceled)

Claim 24: (Previously Presented) A process for producing redispersible nanocorundum with an average particle size $D_{50} < 100$ nm with addition of nuclei that promote transformation to corundum in subsequent annealing, comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, chlorine-free inorganic precursors;

(b) hydrolyzing the solution or the sol of (a) through the addition of a base in a mole ratio of base:precursor of 1 to 3;

(c) aging the hydrolyzed solution or sol of (b) at temperatures between 60 and 98°C for 1 to 72 hours;

(d) subsequently drying the aged solution or sol of (c) followed by calcination at temperatures between 350 and 650°C for converting hydrolyzed precursor into a semiamorphous intermediate phase and ultimately into transitional aluminum oxides; and

(e) performing annealing by increasing temperature to ≤ 950°C for converting product of (d) into corundum phase.

25. (Currently Amended) The process according to claim 24 wherein the calcination of (d) is carried out at temperatures of 400 to 600°C for 0.5 to 2 hours, and the ~~further~~ annealing of (e) for formation of corundum is carried out by a temperature increase to 650 - 900°C for 0.5 to 1 hours.

26. (Previously Presented) The process according to claim 24 wherein at least one of the transitional aluminum oxides and corundum are ground.

27. (Previously Presented) The process according to claim 26 wherein the grinding of the at least one of the transitional aluminum oxides and corundum is carried out in an organic liquid.

28. (Previously Presented) The process according to claim 24 wherein after the aging of the hydrolyzed solution or sol, a gel formation or a liquid shaping is carried out, subsequently the drying, calcination and annealing take place and after the annealing a sintering is carried out at temperatures above the corundum formation temperature.

29. (Previously Presented) A process for producing redispersible nanocorundum with an average particle size $D_{50} < 100$ nm with addition of nuclei that promote transformation to corundum in subsequent annealing, comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, organic precursors;

(b) hydrolyzing either (i) with excess water through addition of the precursor solution or the precursor sol of (a) to water at a mole ratio of water:precursor > 3, and with addition of an acid that leads to pH = 3-5, or (ii) through addition of an amount of water restricted to a mole ratio of water:precursor ≤ 3 to the precursor solution or precursor sol of (a) that are to be mixed with complex-forming ligands;

(c) aging the hydrolyzed solution or sol of (b) at temperatures of ≤ 50°C within 5 hours, and subsequently aging at temperatures of 80 to 98°C within 1 to 24 hours;

(d) subsequently drying the aged solution or sol of (c) followed by calcination at temperatures between 350 and 650°C for converting the hydrolyzed precursor into a semiamorphous intermediate phase and then to transitional aluminum oxides; and

(e) performing annealing by increasing temperature to ≤950°C for converting product of (d) into corundum phase.

30. (Currently Amended) The process according to claim 29, wherein the calcination of (d) is carried out at temperatures of 400 to 600°C for 0.5 to 2 hours, and the ~~further~~ annealing of (e) for formation of corundum is carried out by a temperature increase to 650 - 900°C for 0.5 to 1 hours.

31. (Previously Presented) The process according to claim 29 wherein at least one of the transitional aluminum oxides and corundum are ground.

32. (Previously Presented) The process according to claim 31 wherein the grinding of the at least one of the transitional aluminum oxides and corundum is carried out in an organic liquid.

33. (Previously Presented) The process according to claim 29 wherein after the aging of the hydrolyzed solution or sol, a gel formation or a liquid shaping is carried out, subsequently the drying, calcination and annealing take place and after the annealing a sintering is carried out at temperatures above the corundum formation temperature.

34. (Previously Presented) Nanocorundum powders comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at least 60% α-aluminum oxide, and the powders are redispersible.

35. (Previously Presented) A process for the production of sintered corundum products in a form of dense or porous compact bodies, layers or granulates, comprising sintering nanocorundum powders according to claim 34 at temperatures $\leq$ 1450°C to form granulate or sintered corundum bodies having an average grain size of $\leq 0.6\ \mu$m.

36. (Previously Presented) A process for coating a porous or dense metallic substrate wherein particles of the hydrolyzed sol or particles of a suspension of nanocorundum produced according to claim 24 are electrophoretically deposited on the metallic substrate, and subsequently subjected to annealing.

37. (Previously Presented) A process for coating a porous or dense metallic substrate wherein particles of the hydrolyzed sol or particles of a suspension of nanocorundum produced according to claim 29 are electrophoretically deposited on the metallic substrates, and subsequently subjected to annealing.

38. (Previously Presented) A process for the production of sintered porous or dense corundum layers on a substrate by a process for producing redispersible nanocorundum with an average particle size $D_{50} < 100$ nm with addition of nuclei that promote transformation to corundum in subsequent annealing, comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, chlorine-free inorganic precursors;

(b) hydrolyzing the solution or the sol of (a) through the addition of a base in a mole ratio of base:precursor of 1 to 3;

(c) aging the hydrolyzed solution or sol of (b) at temperatures between 60 and 98°C for 1 to 72 hours;

(d) applying the aged hydrolyzed solution or sol of (c);

(e) subsequently drying the applied aged solution or sol of (d) followed by calcination at temperatures between 350 and 650°C for converting hydrolyzed precursor into a semiamorphous intermediate phase and ultimately into transitional aluminum oxides; and

(f) performing annealing by increasing temperature to $\leq$ 950°C for converting product of (e) into corundum phase.

39. (Previously Presented) The process according to claim 38 wherein after the aging of the solution or the sol, the material is deposited on a substrate with gel formation.

40. (Previously Presented) The process according to claim 38 wherein, after the annealing for coverting into the corundum phase, a sintering is carried out at temperatures above the corundum formation temperature.

41. (Previously Presented) The process according to claim 38 wherein, after the annealing, at least one further coating and at least one further annealing is carried out.

42. (Previously Presented) A process for the production of sintered porous or dense corundum layers on a substrate by a process for producing redispersible nanocorundum with an average particle size $D_{50} < 100$ nm with addition of nuclei that promote transformation to corundum in subsequent annealing, comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, organic precursors;

(b) hydrolyzing either (i) with excess water through addition of the precursor solution or the precursor sol of (a) to water at a mole ratio of water:precursor > 3, and with addition of an acid that leads to pH = 3-5, or (ii) through addition of an amount of water restricted to a mole ratio of water:precursor ≤ 3 to the precursor solution or precursor sol of (a) that are to be mixed with complex-forming ligands;

(c) aging the hydrolyzed solution or sol of (b) at temperatures of $\leq$ 50°C within 5 hours, and subsequently aging at temperatures of 80 to 98°C within 1 to 24 hours;

(d) applying the aged hydrolyzed solution or sol of (c);

(e) subsequently drying the applied aged solution or sol of (d) followed by calcination at temperatures between 350 and 650°C for converting the hydrolyzed precursor into a semiamorphous intermediate phase and then to transitional aluminum oxides; and

(f) performing annealing by increasing temperature to $\leq$950°C for converting product of (e) into corundum phase.

43. (Previously Presented) The process according to claim 42 wherein after the aging of the solution or the sol, the material is deposited on a substrate with gel formation.

44. (Previously Presented) The process according to claim 42 wherein, after the annealing for coverting into the corundum phase, a sintering is carried out at temperatures above the corundum formation temperature.

45. (Previously Presented) The process according to claim 42 wherein, after the annealing, at least one further coating and at least one further annealing is carried out.

46. (Previously Presented) Al_2O_3 sintered product comprising a sintered mass of the nanocorundum produced according to claim 28 and which consists essentially of Al_2O_3, wherein through annealing at 650 to 1250°C, there is a phase composition of more than 80% corundum and an average pore size of 10 - 100 nm with a porosity of $\geq$ 30% by volume.

47. (Previously Presented) Al_2O_3 sintered product comprising sintered corundum layers on a substrate produced according to claim 38 and which consists essentially of Al_2O_3, wherein through annealing at 650 to 1250°C, there is a phase composition of more than 80% corundum and an average pore size of 10 - 100 nm with a porosity of $\geq$ 30% by volume.

48. (Previously Presented) Al_2O_3 sintered product comprising sintered corundum layers on a substrate produced according to claim 42 and which consists essentially of Al_2O_3, wherein through annealing at 650 to 1250°C, there is a phase composition of more than 80% corundum and an average pore size of 10 - 100 nm with a porosity of $\geq$ 30% by volume.

49. (Previously Presented) Dense sinter corundum layers consisting essentially of Al_2O_3 on a substrate produced by a process for producing redispersible nanocorundum with an average particle size $D_{50} < 100$ nm with addition of nuclei that promote transformation to corundum in subsequent annealing, which process comprises:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, chlorine-free inorganic precursors;

(b) hydrolyzing the solution or the sol of (a) through the addition of a base in a mole ratio of base:precursor of 1 to 3;

(c) aging the hydrolyzed solution or sol of (b) at temperatures between 60 and 98°C for 1 to 72 hours;

(d) applying the aged hydrolyzed solution or sol of (c) to a substrate;

(e) subsequently drying the applied aged solution or sol of (d) followed by calcination at temperatures between 350 and 650°C for converting hydrolyzed precursor into a semiamorphous intermediate phase and ultimately into transitional aluminum oxides; and

(f) performing annealing by increasing temperature to $\leq$ 950°C for converting product of (e) into corundum phase,

wherein the substrate is composed of a different material from the corundum layers, and in which through sintering at a temperature of $\leq$ 1250°C there is an average grain size of ≤ 0.5 μm.

50. (Previously Presented) Dense sinter corundum layers consisting essentially of Al_2O_3 on a substrate produced by a process for the production of sintered porous or dense corundum layers on a substrate by a process for producing redispersible nanocorundum with an average

particle size $D_{50} < 100$ nm with addition of nuclei that promote transformation to corundum in subsequent annealing, which process comprises:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, organic precursors;

(b) hydrolyzing either (i) with excess water through addition of the precursor solution or the precursor sol of (a) to water at a mole ratio of water:precursor > 3, and with addition of an acid that leads to pH = 3-5, or (ii) through addition of an amount of water restricted to a mole ratio of water:precursor ≤ 3 to the precursor solution or precursor sol of (a) that are to be mixed with complex-forming ligands;

(c) aging the hydrolyzed solution or sol of (b) at temperatures of $\leq$ 50°C within 5 hours, and subsequently aging at temperatures of 80 to 98°C within 1 to 24 hours;

(d) applying the aged hydrolyzed solution or sol of (c) to a substrate;

(e) subsequently drying the applied aged solution or sol of (d) followed by calcination at temperatures between 350 and 650°C for converting the hydrolyzed precursor into a semiamorphous intermediate phase and then to transitional aluminum oxides; and

(f) performing annealing by increasing temperature to $\leq$950°C for converting product of (e) into corundum phase,

wherein the substrate is composed of a different material from the corundum layers, and in which through sintering at a temperature of $\leq$ 1250°C there is an average grain size of $\leq 0.5\ \mu$m.

51. (Previously Presented) A process for producing nanoporous Al_2O_3 sintered products comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, chlorine-free inorganic precursors;

(b) hydrolyzing the solution or the sol of (a) through the addition of a base in a mole ratio of base:precursor of 1 to 3;

(c) aging the hydrolyzed solution or sol of (b) at temperatures between 60 and 98° C for 1 to 72 hours; and

(d) subsequently drying followed by calcination at temperatures between 350 and 750°C for converting hydrolyzed precursors into aluminum oxide.

52. (Previously Presented) A process for production of nanoporous layers comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, chlorine-free inorganic precursors;

(b) hydrolyzing the solution or the sol of (a) through the addition of a base in a mole ratio of base:precursor of 1 to 3;

(c) aging the hydrolyzed solution or sol of (b) at temperatures between 60 and 98° C for 1 to 72 hours;

(d) applying the aged solution or the sol of (c) to a substrate; and

(e) subsequently drying followed by calcination at temperatures between 350 and 750°C for converting hydrolyzed precursors into aluminum oxide.

53. (Previously Presented) The process according to claim 52 wherein gel formation occurs upon application to a substrate.

54. (Previously Presented) The process according to claim 51 wherein nuclei of a transitional aluminum oxide are added to the solution or to the sol prior to (b).

55. (Previously Presented) A process for coating a porous or dense metallic substrate~~,~~ comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, chlorine-free inorganic precursors;

(b) hydrolyzing the solution or the sol of (a) through the addition of a base in a mole ratio of base:precursor of 1 to 3;

(c) aging the hydrolyzed solution or sol of (b) at temperatures between 60 and 98° C for 1 to 72 hours;

(d) electrophoretically depositing on the metallic substrate particles of the aged hydrolyzed sol or particles of a suspension of nanoporous aluminum oxide of (c); and

(e) subsequently drying followed by calcination at temperatures between 350 and 750°C for converting hydrolyzed precursors into aluminum oxide.

56. (Previously Presented) The process for coating porous or dense metallic substrates according to claim 55 wherein after the electrophoretic deposit of the particles, a heat treatment is carried out at temperatures of 350 - 750°C.

57. (Previously Presented) Nanoporous Al_2O_3 sintered products, produced according to claim 51 in which there is an average pore diameter in the range between 0.5 and 2.5 nm at a porosity of ≥30% by volume.

58. (Previously Presented) A process for producing nanoporous Al_2O_3 sintered products, comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, organic precursors;

(b) hydrolyzing either (i) with excess water through addition of the precursor solution or the precursor sol of (a) to water at a mole ratio of water:precursor ≻ 3, and with addition of an acid that leads to pH = 3-5, or (ii) through addition of an amount of water restricted to a mole ratio of water:precursor ≤ 3 to the precursor solution or precursor sol of (a) that are to be mixed with complex-forming ligands;

(c) aging the hydrolyzed solution or sol of (b) at temperatures of ≤ 50°C within 5 hours, and subsequently aging at temperatures of 80 to 98°C within 1 to 24 hours; and

(d) subsequently drying the aged solution or sol of (c) followed by calcination at temperatures between 350 and 750°C for converting hydrolyzed precursors into aluminum oxide.

59. (Previously Presented) A process for production of nanoporous layers comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, organic precursors;

(b) hydrolyzing either (i) with excess water through addition of the precursor solution or the precursor sol of (a) to water at a mole ratio of water:precursor > 3, and with addition of an acid that leads to pH = 3-5, or (ii) through addition of an amount of water restricted to a mole ratio of water:precursor ≤ 3 to the precursor solution or precursor sol of (a) that are to be mixed with complex-forming ligands;

(c) aging the hydrolyzed solution or sol of (b) at temperatures of ≤ 50°C within 5 hours, and subsequently aging at temperatures of 80 to 98°C within 1 to 24 hours;

(d) applying the aged solution or the sol of (c) a substrate; and

(e) subsequently drying the aged solution or sol of (d) followed by calcination at temperatures between 350 and 750°C for converting hydrolyzed precursors into aluminum oxide.

60. (Previously Presented) The process according to claim 59 wherein gel formation occurs upon application to a substrate.

61. (Previously Presented) The process according to claim 58 wherein nuclei of a transitional aluminum oxide are added to the solution or to the sol prior to (b).

62. (Previously Presented) A process for coating a porous or dense metallic substrate~~,~~ comprising:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, organic precursors;

(b) hydrolyzing either (i) with excess water through addition of the precursor solution or the precursor sol of (a) to water at a mole ratio of water:precursor $\succ$ 3, and with addition of an acid that leads to pH = 3-5, or (ii) through addition of an amount of water restricted to a mole ratio of water:precursor $\leq$ 3 to the precursor solution or precursor sol of (a) that are to be mixed with complex-forming ligands;

(c) aging the hydrolyzed solution or sol of (b) at temperatures of $\leq$ 50°C within 5 hours, and subsequently aging at temperatures of 80 to 98°C within 1 to 24 hours;

(d) electrophoretically depositing on the metallic substrate particles of hydrolyzed sol or particles of a suspension of nanoporous aluminum oxide of (c); and

(e) subsequently drying the aged solution or sol of (d) followed by calcination at temperatures between 350 and 750°C for converting hydrolyzed precursors into aluminum oxide.

63. (Previously Presented) The process for coating porous or dense metallic substrates according to claim 62 wherein after the electrophoretical deposit of the particles, a heat treatment is carried out at temperatures of 350 - 750°C.

64. (Previously Presented) Nanoporous Al_2O_3 sintered products, produced according to claim 58 in which there is an average pore diameter in the range between 0.5 and 2.5 nm at a porosity of $\geq$30% by volume.

65. (Previously Presented) Nanocorundum powder produced according to the process recited in claim 24 comprising a median value of particle size distribution $D_{50} < 100$ nm.

66. (Previously Presented) Nanocorundum powder produced according to the process recited in claim 29 comprising a median value of particle size distribution $D_{50} < 100$ nm.

67. (Previously Presented) Nanocorundum powders produced according to the process recited in claim 24 comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at least 60% α-aluminum oxide, and the powders are redispersible.

68. (Previously Presented) Nanocorundum powders produced according to the process recited in claim 29 comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at least 60% α-aluminum oxide, and the powders are redispersible.